

## [2.8] Use `expand()` with respect to variable for faster results

The `expand()` function may work faster and more completely if you expand with respect to a variable in the expression. For example, this takes over 11 minutes on my 92 w/Plus module AMS2.03:

```
expand(((3*a+2*b)/(2*a^2-5*b)*z-(7*a-2*b)/(3*a-b^2))^2)
```

and also warns that *Memory full, simplification might be incomplete*, but this takes less than 4 seconds:

```
expand(((3*a+2*b)/(2*a^2-5*b)*z-(7*a-2*b)/(3*a-b^2))^2, z)
```

and returns the same result, without the *Memory full* warning message. Note that the only difference is that the `z` variable argument has been added in the second example. The result is

$$\frac{(3a+2b)^2 z^2}{(2a^2-5b)^2} - \frac{2(3a+2b)(7a-2b)z}{(3a-b^2)(2a^2-5b)} + \frac{(7a-2b)^2}{(3a-b^2)^2}$$

which is not completely expanded. If this result is again expanded:

```
expand((3*a+2*b)^2*z^2/(2*a^2-5*b)^2-2*(3*a+2*b)*(7*a-2*b)*z/((3*a-b^2)*(2*a^2-5*b))+(7*a-2*b)^2/(3*a-b^2)^2)
```

the result (not shown here) is returned after about 5 seconds, completely expanded.

(Credit to Bhuvanesh Bhatt)